

ABSTRACT

A $\text{Si}_{1-x}\text{Ge}_x$ layer 111b functioning as the base composed of an $\text{i-Si}_{1-x}\text{Ge}_x$ layer and a p^+ $\text{Si}_{1-x}\text{Ge}_x$ layer is formed on a collector layer 102, and a Si cap layer 111a as the emitter is formed on the p^+ $\text{Si}_{1-x}\text{Ge}_x$ layer. An emitter lead electrode 129, which is composed of an n^- polysilicon layer 129b containing phosphorus in a concentration equal to or lower than the solid-solubility limit for single-crystal silicon and a n^+ polysilicon layer 129a containing phosphorus in a high concentration, is formed on the Si cap layer 111a in a base opening 118. The impurity concentration distribution in the base layer is properly maintained by suppressing the Si cap layer 111a from being doped with phosphorus (P) in an excessively high concentration. The upper portion of the Si cap layer 111a may contain a p-type impurity. The p-type impurity concentration distribution in the base layer of an NPN bipolar transistor is thus properly maintained.